Idaho National Engineering and Environmental Laboratory

DOE Canister Drop Test Findings (Early Results)

National SNF Program
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FY 2004 DOE Canister Drop Testing Program

- Drop testing performed at Sandia National Laboratory in August 2004 to an approved QA program
- Hanford provided two production Multi-Canister Overpacks with internal baskets and added weights
- INEEL fabricated two Idaho Spent Fuel Project 24-in. canister with simulated weights
- The testing was witnessed by NRC and RW staffs

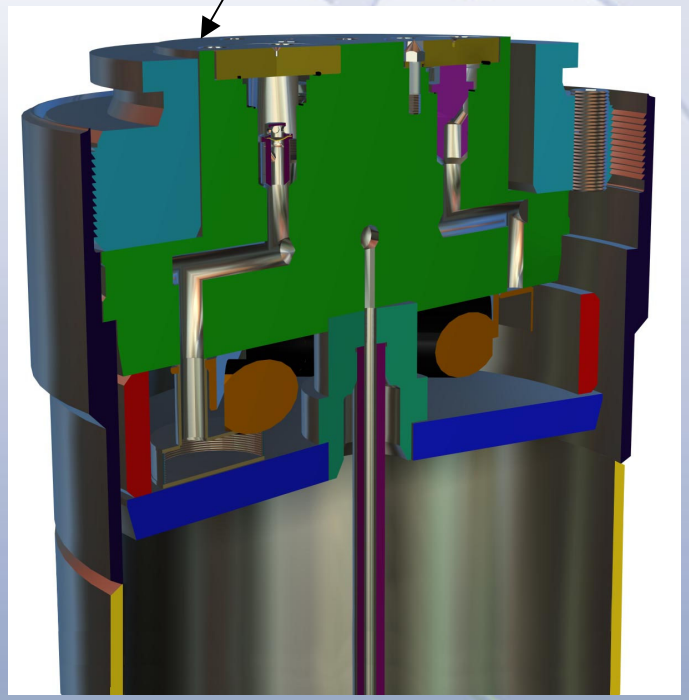
Drop Test Oversight Team

MCO Details

- *The MCO is a nominal 24-inch diameter with the top cover having a 25.31-inch diameter and an overall length of 13.86 feet*
- *Total weight up to 20,080 pounds*
- *ASME B&PV Code, Section III, Division 1, Subsection NB with Code Case N-595 for storage containment, with Design Specification covering just pressure and temperature*
- *Contains either six Mark 1A or five Mark IV fuel or scrap baskets*

MCO Internals

A final closure cover (not shown) is seal-welded over the head.



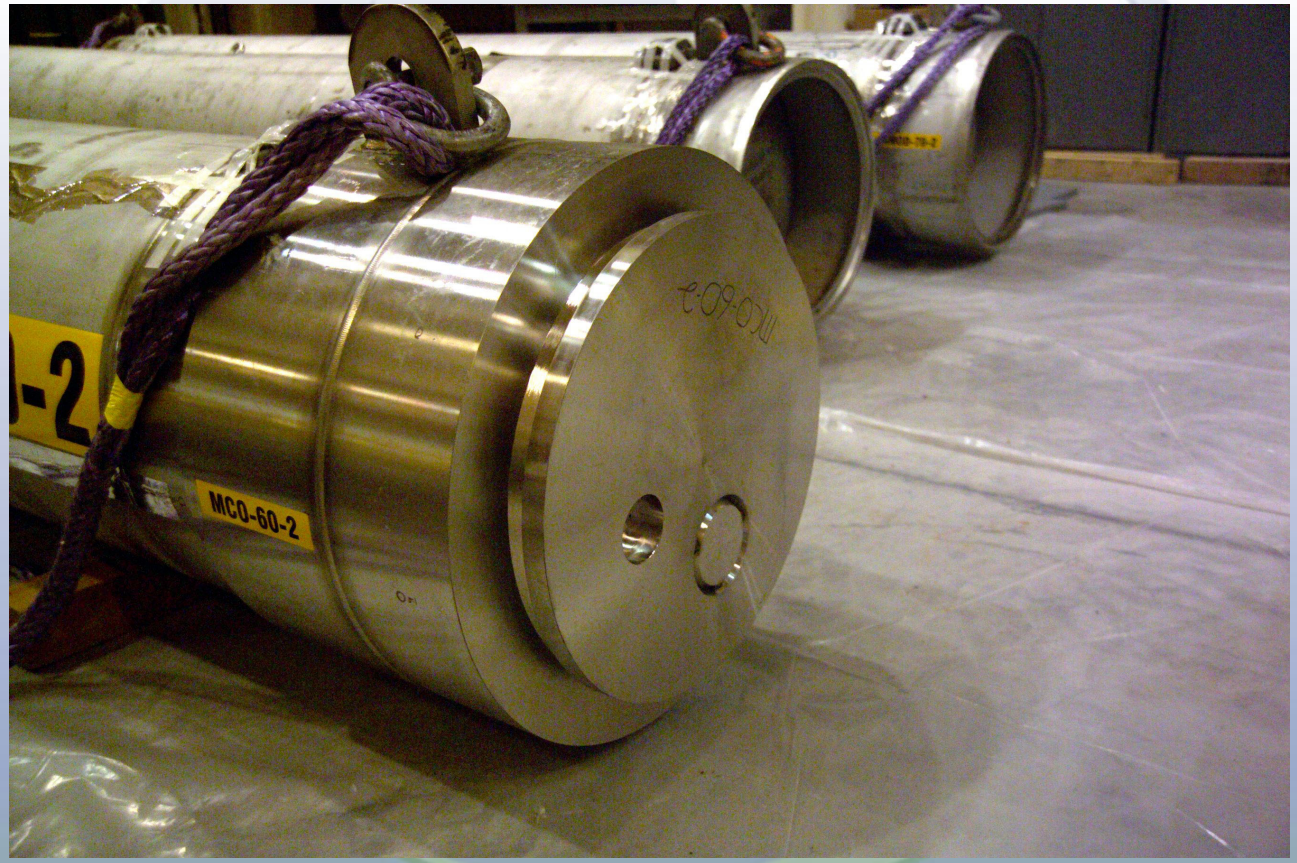
Closure Head

Mark 1A Fuel and scrap baskets

Internals for the MCO Canisters

MCO Mark IV Bottom Basket

MCO with Top Seal and Lift Lug



MCOs and 24-in. Canisters

ISFP Canister Details

- *The ISFP canisters are virtually identical to the standardized DOE SNF canisters from an outside appearance (10,000 lbs)*
- *Design modifications include:*
  - *Thicker heads (machined to match OD/ID)*
  - *Retaining plates welded to inside of head to support impact plate position*
  - *Support rings welded to inside of shell to support the shield plug*
  - *No internal sleeve*
- *ASME B&PV Code, Section III, Division 1, Subsection NB with Code Case N-595 for storage containment design basis*

Shoring and Shield Plugs in 24-In. Canister

Internal Configuration of the 24-inch Canisters

Repository Criteria

- *DOE/RW-0351, Waste Acceptance System Requirements Document (WASRD) contains repository requirements for disposable DOE SNF canisters*
- *WASRD defines two specific drop scenarios to consider when limiting the potential release of radioactivity*
  - *23-foot vertical drop onto unyielding surface*
  - *2-foot worst orientation drop onto unyielding surface*

MCO Drop Tests

- *Different design, no skirt, twice as heavy*
- *Different material*
- *Repository drops impact directly on containment material*
- *MCO baskets are predicted to significantly deform*
- *Two drop tests identified*
  - *Vertical 23-foot drop for most drop energy possible and significant basket deformation validation*
  - *Two-foot worst orientation due to highest containment strains*

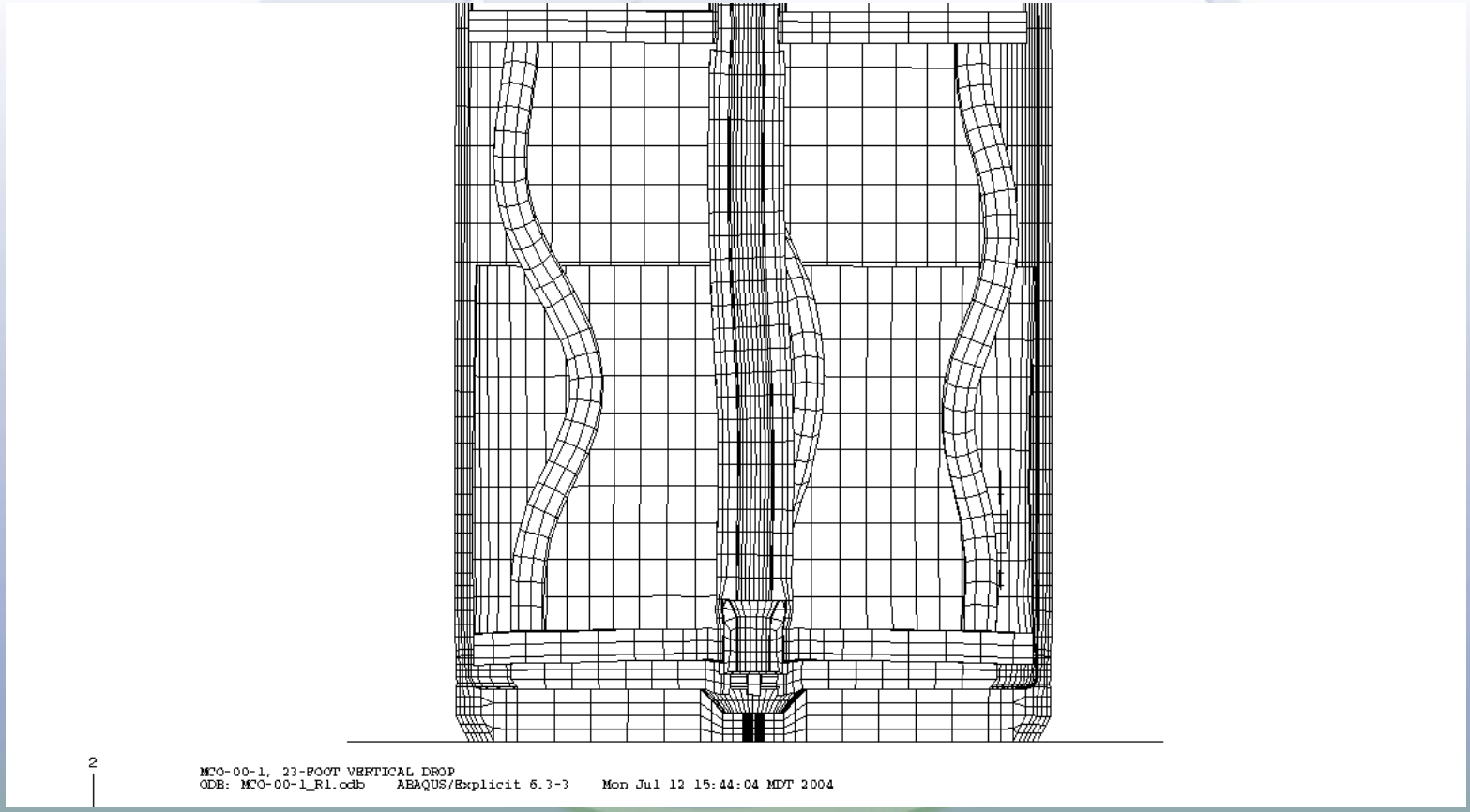
24-inch ISFP Drop Tests

- *24-Inch ISFP canister (Tetra Tech FW DOE SNF canister design)*
  - *Plastic strains similar to the standardized DOE SNF canister*
  - *Only identified use of 24-inch standardized DOE SNF canister is at Idaho*
- *Two drop tests identified*
  - *Tests performed from 30-ft*
  - *Slapdown drop due to highest containment strains*
  - *45-degree drop to validate significant skirt response, plug interface, and gain friction insights*

23-ft. MCO Drop

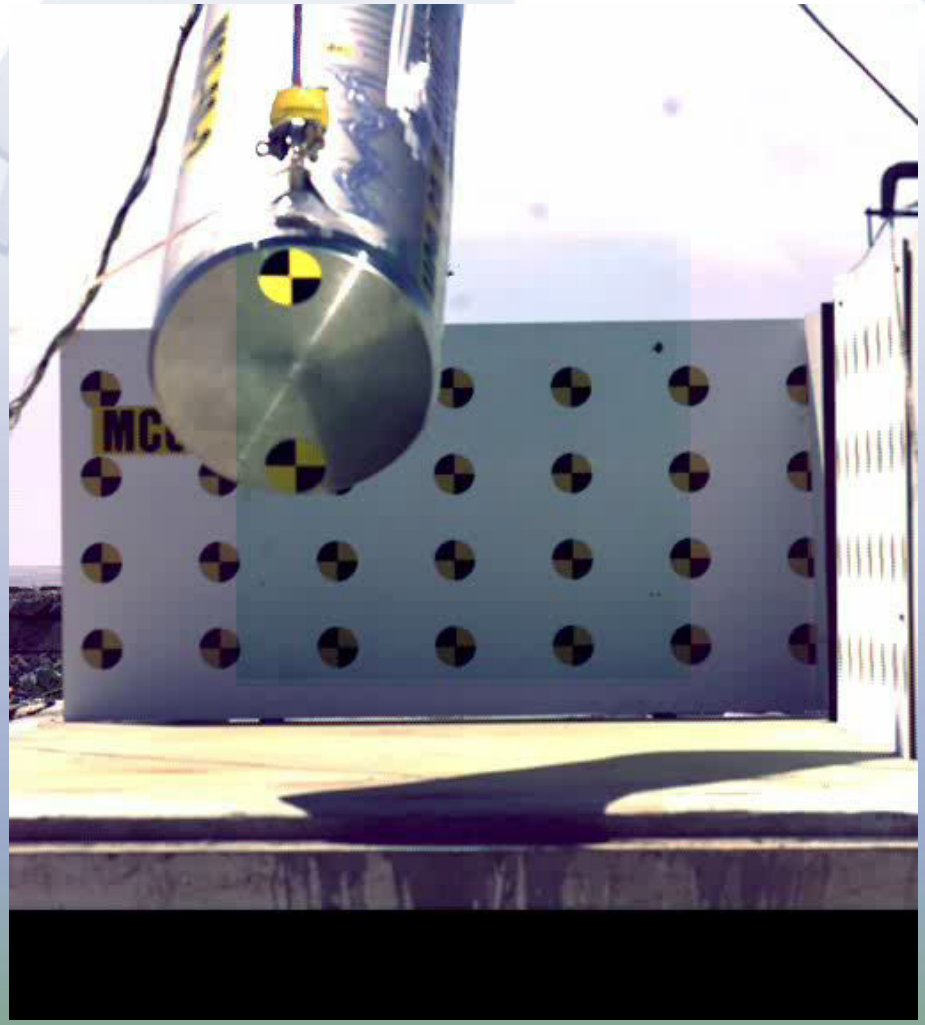
MCO Vertical Drop from 23-ft.

MCO-00-1 Bottom-End Deformations (Section View, MCO in Rebound)



MCO from 2-ft. and 60 Degrees

MCO 2-ft. Drop at 60 Degrees

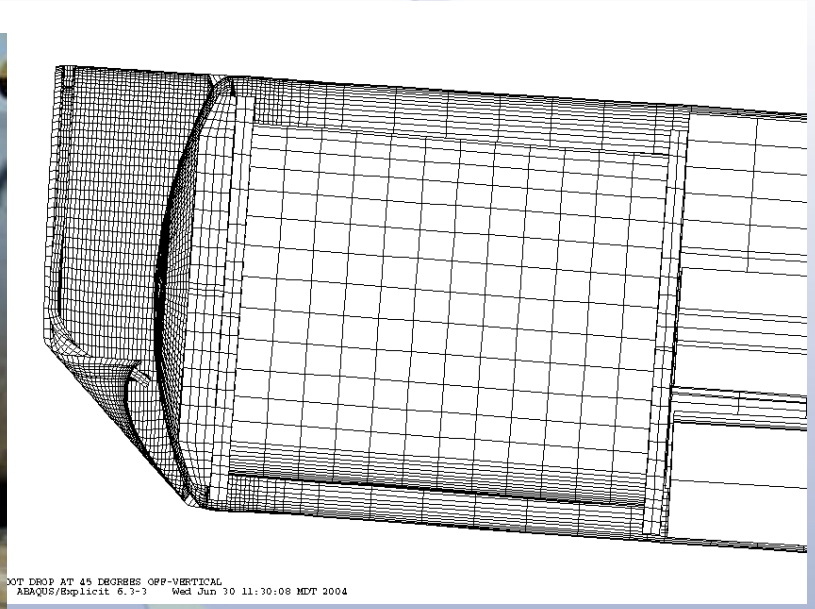


Standard Canister from 30-ft. at 45 Degrees

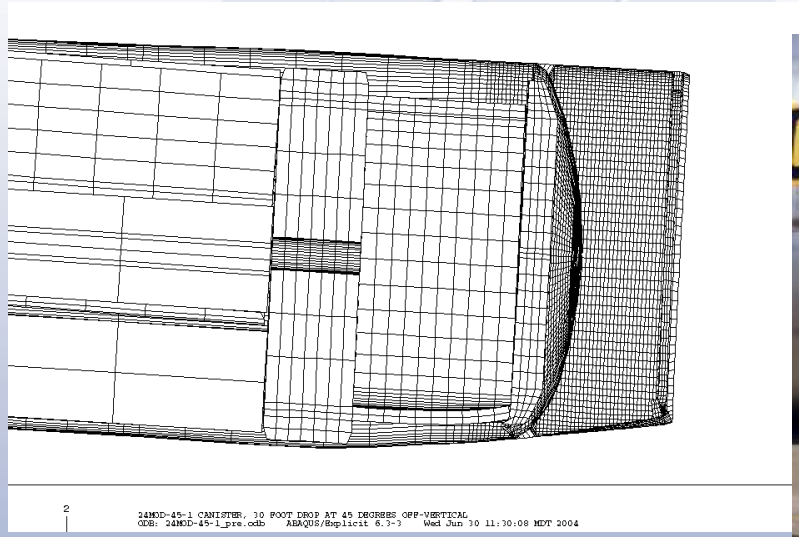
24-in. DOE Canister 45° from 30 ft.

Post-test Observations

24MOD-45-1 Bottom-End Deformations (Section View After Rebound)



24MOD-45-1 Top-End Deformations (Section View After Rebound)



Post-test Analysis of Drop Tests

- *Perform dimensional inspections*
- *Perform helium leak tests*
  - *Leak test on 24-in. canisters*
  - *Helium sniff on the MCOs*
- *Disassembly and inspection of canisters*
- *Compare pretest predictions against results*
- *Issue final test report*
- *Disposal of potentially contaminated MCO heads*
- *No further full scale canister drop testing anticipated*